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Forces from temperature quenches in thermal and active matter

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Non-equilibrium systems are known to exhibit long-ranged correlations in the presence of dynamical conservation laws. This phenomenon gives rise to various types of fluctuation-induced forces between objects immersed in non-equilibrium media. However, driving systems out of equilibrium, for instance by changing their temperature, may also result in changes of the mean density.

In this talk I will discuss our recent work on non-equilibrium fluctuation-induced (Casimir) forces [1,2] and density-induced forces [2] arising from temperature quenches in thermal and active matter. Focusing on temperature quenches, we predict theoretically and demonstrate with simulations the existence of both these types of forces between objects immersed in a conserved density. (In active matter, a quench could be achieved by a rapid change in activity.) We discuss the distinguishing features of fluctuation-induced and density-induced forces as regards universality, time-scales and scaling. By considering microscopic theories and coarse-graining procedures, we propose methods to extract the fluctuation-induced contribution of forces in simulations. Simulation results [2] display the scaling in space and time predicted in [1].

[1] C.M. Rohwer, M. Kardar, M. Krüger, Phys. Rev. Lett. 015702 **118** (2017)

[2] C.M. Rohwer, A. Solon, M. Kardar, M. Krüger, *in preparation* (2017)

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